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Blake's Patent Steam Pump.

Any one of ordinary observation, who visits the various State Fairs and other exhibitions, where machinery and mechanical inventions and improvements make, as they always do, a large and distinctive part, cannot fail to notice the large share given in all these displays to appliances for raising water. This proves, simply, that we are well advanced in civilization; for a certain criterian of the progression of a nation in enlightenment and refinement, is to be discovered in the excelence of their appliance for raising and moving water. In other words *pumps* are an index of civilization. In this connection we give a perspective illustration of Blake's Patent Steam Pump, which is claimed to be superior in this line, for the following reasons.

That it is positive under any pressure; will run at any speed,—slower or faster than any other; will discharge more water than any other pump of same dimension. The steam part being cast in one piece obviates the trouble arising from leaky steam joints, which are always a source of vexation.

Any part can be disengaged without interfering with another part.

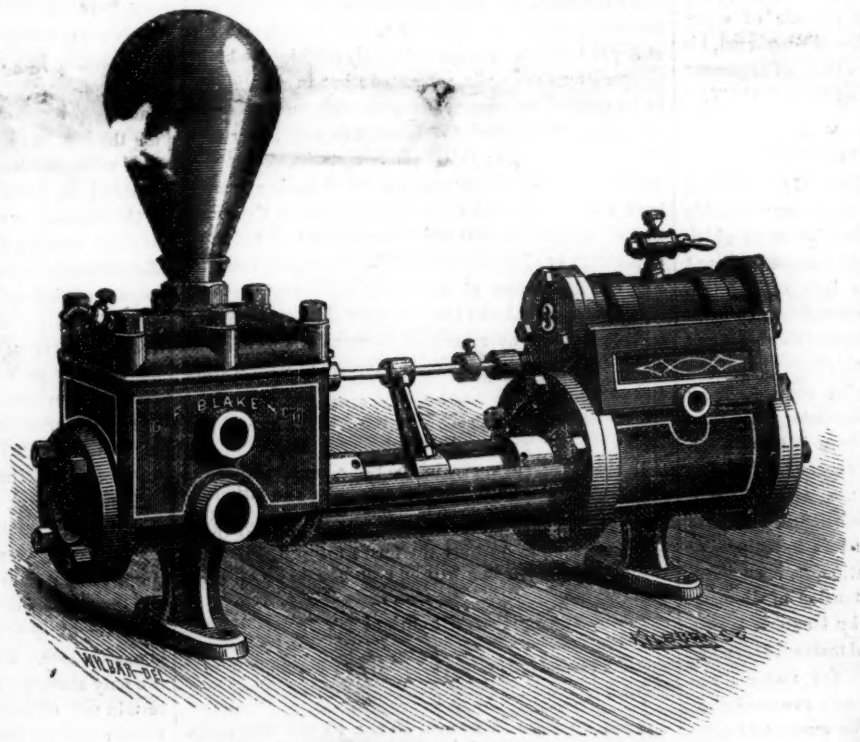
The steam valve is perfectly balanced.

It will start at any point of the stroke, and will discharge the cold water of condensation.

The workmanship and materials are of the very best class, being equal to the best built engines.

It will perform a greater amount of labor than is stated.

The illustration gives a good idea of the general construction and compactness of this pump, which together with the remarks above are all that is necessary to say. Further particulars may be obtained of the manufacturers, Geo. F. Blake & Co., 51 Chardon street, Boston, Mass., and 79 Liberty street, New York.



BLAKE'S PATENT STEAM PUMP.

The Brazilian Gas Fuel Company.

This company, with a capital of 100,000*l.*, in shares of 10*l.* each, has issued its prospectus. The object of the enterprise is to purchase and work a concession from the Brazilian Government for 30 years (about to be extended to 90 years) for the sole right of working "turba," or brown coal deposits, discovered in the province of Bahia. The concession includes extensive deposits of petroleum, which exist in the same locality, The property is situated on the banks of the River Marahu, about 60 miles from the city of Bahia. The river is navigable for vessels drawing 18 feet of water to the place of shipment, which is near the turba beds.

The Rev. Mr. Nicolay, late British Consular chaplain at Bahia, a sound geologist and mineralogist, states that the deposits are comparatively inexhaustible, capable of being worked advantageously, and easily accessible for shipping purposes; that the richness of the gas produced is extraordinary, the substance bearing a pretty close resemblance to Boghead Cannel; that the quantity of gas (12,000 feet of 37 candle to the ton) is very large, the yield comparing favorably with that of Boghead Cannel; and that the gas is easily driven off. It is considered that these discoveries of turba will by cheapening tend to increase the demand for gas, thus opening up a market for a still larger quantity of this combustible mineral, and at the same time largely benefiting the gas companies already established, as well as those now in course of formation. The cost of excavating and delivering the turba will, it is calculated leave a margin of from 15s. to 20s. per ton on the present prices of common coal, and 25s. to 30s. per ton on the present prices of cannel. The purchase money is fixed at 25,000*l.*, of which 20,000*l.* is to be taken in fully paid-up shares of the company.—*Lon. Min. Jour.*

A New Anæsthetic—Chloralhydrat.

From time to time Divine Providence sends a new boon to suffering humanity. First ether, then chloroform and nitrous oxide; now Dr. Leebach, of Germany has discovered another, to which he has given the name of chloralhydrat. It is highly spoken of by the medical men abroad, and said to be superior to chloroform in producing a more complete state of unconciousness, while it neither induces feebleness nor leaves any bad effects behind. He has held rabbits from twelve to fourteen hours under the influence of chloralhydrat, during a part of which time he kept them suspended over the back of a chair, and as soon as they awakened up they displayed their usually activity and fed with unimpaired appetite. We learn that the newly discovered body has been most successfully applied as a sedative in the treatment of the insane. Chloralhydrat resembles chloroform in appearance, but it is not so heavy; and being much less volatile than that body, it has a feebler smell. On the tongue it has a sharp but not an acrid taste; and thongh it reminds one of chloroform, it gives the sensation neither of warmth nor sweetness, like the latter. Chlorlhyadrat is absorbed and not inhaled, and in this respect differs from all other anæsthetics. When liquid ammonia is added to a solution of this body, chlorform is precipitated. The benefit of this to suffering humanity can hardly be over-estimated.—*Exchange.*

Professor Lane has introduced the Continental pronunciation of Latin and Greek at Harvard, and it is to be used hereafter in the instruction of all the classes.

Chemical Repertory.--No. 18.

NOVEMBER 16, 1869.

Editorial.

THE STUDY AND CLASSIFICATION OF CARBON MINERALS.

This is one of the Sciences of the Future, of which the foundations are b just being laid, but which is is destined soon to excite a high interest in the scientific world, and to bring forth fruits which may not be despised. So far, the laborers in this field may almost be counted on the fingers, but nevertheless the good seed is being sown. The importance of this neglected study will appear on considering that this class of minerals furnishes practically all our artificial heat and light. On Monday evening of last week (Nov. 8,) the present writer made a communication on this subject to the LYCEUM OF NATURAL HISTORY of New York, which appeared to excite the interest of the members in attendance, in so far that he was specially invited to pursue the subject at the ensuing meeting (*Monday November* 15), that evening being set apart for discussion thereof. The substance of these communications will be presented in a series of articles in these columns. At present the topic is alluded to in order to express the great regret of the writer that a long expected document came to hand *just too late* for the present issue. This is a paper in the forthcoming (*November*) number of the *American Journal of Science* (of which a printer's proof has been forwarded to us at our request) by Professor PECKHAM, now of the Industrial College of Maine; "*On the probable Origin of Albertite and allied Minerals.*" Besides the general interest of the subject, the present writer is naturally gratified by the fact that the fundamental theoretical views regarding the mode of origin (geologically) of these minerals, published by himself years since, in which he has hitherto stood alone against the opposition of all other geologists, and the ridicule of some, are here most emphatically adopted and supported, his own reasoning being endorsed in a train of argument which must prove altogether irrefutable. H. W.

DISSOCIATION AND THE SOLAR PHOTOSPHERE.

Professor JOY, in the November issue of the *Journal of Applied Chemistry*, has given us a very valuable historical digest on the subject of dissociation, in which he has manifested a remarkable and unusual amount of research. We infer, from the lack of mention thereof, that Prof. JOY has not observed our own digest, presented during the last summer (REPERTORY of *July* 16th and *August* 2d) of DEVILLE'S latest papers on this subject, from the *Comptes Rendus* and the *Revue des Cours Scientifique*, comprising some later ideas than the papers he has himself cited. There is also an exceedingly important paper in POGGENDORFF'S *Annalen*, vol. 131, p. 55, by LEOPOLD PFAUNDLER, which the writer has intended presenting, in substance, in these columns. PFAUNDLER sustains DEVILLE'S hypothesis of the exact analogy between dissociation and evaporation, implying the existence of a "tension of dissociation," which, as the term is used by DEVILLE, is proportional to the amount of dissociated matter in a space, or inversely as the amount of combined matter; and which increases as the temperature and pressure diminish; or, what is the same thing, the amount of *combined* matter increases as the temperature and pressure increase, just as the amount of *condensed* matter in a vapor increases. Hence DEVILLE'S hypothesis of the so-called tension of dissociation, which, however, must be followed out much further before it can be admitted as a law. Up to this time the weight of experiment seems against it. BUNSEN'S experiments, related in the last chapter of his *Gasometry*, as well as those in his memoir in POGGENDORFF'S *Annalen*, vol. 131, p. 161; as well as more recent and still more important investigations of BERTHELOT, tend rather to the widely diverging conclusion that the effect of varying temperatures on the play of affinities in a gaseous mixture is rather to produce *sudden changes* of molecular equilibria or of combinations and decompositions, analogous to the similar actions upon *liquid* and *solid* bodies, which usually have *fixed points* of temperature or pressure, or both, at which they become *all at once* susceptible to the action of certain molecular affinities previously latent, or "potential energies" if we chose to call them so. There is no room here to handle with any satisfaction, this vast and fecund subject, which belongs to, in fact includes, the Chemistry of the Future; a thing just now in the throes of parturition; an Intellectual Potential Energy, which is destined soon to raise man to his promised rank, "but little lower than the angels." I will but quote the final paragraph of one of BERTHELOT'S latest papers on *Chemical Equilibrium*:

"Thus, *the pressure varying in a continuous way*, the equilibrium between acetylene, carbon and hydrogen changes by *sudden leaps* (*sauts brusques*) and according to multiple ratios. The law of the phenomena is then widely different from that which presides over the tension of vapors."

Nor has Prof. JOY encountered what may be looked as the *earliest* germs of the doctrine called dissociation. He has rightly traced it to the celebrated experiment of GROVE in 1846, of decomposing water by heated platinum, but it has been found that at least one Frenchman had at least five years before this, a clear idea of the resolution of water into its elementary gases and their retention in this state at intense temperatures; a fact developed, and invested with the highest interest, by the recent discoveries and discussions regarding the chemical actions going on in the Sun. In a recent letter to ELIE DE BEAUMONT, FIRMIN ANGELOT quotes a theory of the solar atmosphere from a paper of his in the *Bulletin de la Societe Geologique de France* of Jan. 11, 1841, in which the whole theory is set forth with an incomprehensible degree of prevision of future discovery! In our next we shall give these extracts, with the comments of other eminent scientists thereon.

A few sentences regarding the term *dissociation*, which has been deemed by some a pleonasm. Apparently the word was first confined by DEVILLE to such cases as those of watery vapor, in which elements which at lower temperatures *spontaneously* combine, at higher temperatures are again separated; but in time it came to be applied universally, even in such cases as *ammonia*, where the dissociated elements do not again recombine at lower heats; that is, it came to be accepted as meaning broadly decomposition by the sole agency of heat, applying to such diverse phenonena as the explosion of gunpowder, the resolution by heat of red oxide of mercury or of oxide of silver, the burning of limestone, etc., etc. It seems at present as if the real necessity of the retention of the term is dependent upon the establishment or overthrow of DEVILLE'S hypothesis of dissociative tension as a simple function of temperature and pressure. H. W.

ERRATA.

In the last REPERTORY, in the table representing the constitution of coal-tar hydrocarbons, the equation for *hydruret of naphthaline* should have the $-2H^2$ deleted. The occasion may be taken also to point out that there was a mistake in putting the forms to press. By following the paging this will be eliminated.

American Chemical News.

ORIGINAL COMMUNICATIONS.

ANSWER OF PROF. VAN DER WEYDE TO THE REJOINDER OF PROF. WALLING.

Professor Henry Wurtz:

Dear Sir: I regret exceedingly that Prof. WALLING, in his fight against the modern theory of the Conservation of Force, does not follow my example, and confine the controversy strictly to combating opinions; that he forgets himself so far as to criticise the condition of my mind, and to insinuate ignorance on my part, saying, for instance: "Some minds are so constituted that it is difficult or impossible to convince them by reasoning," etc.; and then proceeding to illustrate it by the opinion of an ignorant miller, w o could not be persuaded of the fact of the earth's rotation.

If I have such thoughts of the state of Prof, WALLING'S mind, or of the amount of information in his possession, common politeness forbids to make such insinuations; and I must confess that on reading this passage, my first impulse was to drop all further discussion with the Professor at once, and not to expose myself to this treatment any more; but on second thought, love of (what I think to be) truth prevailed. I ardently wish to diffuse the clearer conceptions, to which I have arrived during the last twenty years, and to contribute my mite to the more rapid rooting out of the old obscure notions of the possibility of destroying matter or force, or of the spontaneous creation or miraculous reappearance of the latter, which notion especially in regard to force, is still sustained by some.

At the end of his rejoinder, Professor WALLING errs greatly in saying that the conception of an independent force is gaining ground, especially in Europe. The authorities quoted by him, may occasionally cling to some remnants of the old notion; however this is now rapidly disappearing before the new light; and many passages of HELMHOLTZ, FARADAY, and others, prove that they accept the new doctrine. HELMHOLTZ says, for instance: "From all the known physical and chemical processes, we arrive at the conclusion that nature as a whole possesses a store of force which cannot in any way be either increased or diminished; and that therefore the quantity of force in nature is just as eternal and unalterable as the quantity of matter."

If the questions proposed by Professors HENRY and NORTON were really intended as arguments against the conservation theory, and to sustain the hypothesis of independent force, it will only prove (with all due respect to the two eminent gentlemen, be it said) that they have not given much attention to the mental labor of carrying this theory, as founded on the latest discovered data, to its legitimate consequences.

Some forty years ago I was inclined to the same views now held by Prof. WALLING, because I adopted as he does now the old definition that—*force is that which is becoming associated with matter produces or tends to produce motion, change of motion, or obstruction of motion.* But since becoming acquainted with the labors of MAYER, JOULE, GROVE, HELMHOLTZ, TYNDALL, and the principal facts established in this regard during the last twenty-five years, I have abandoned this idea as inconsistent with our increased knowledge, and in this I do by no means stand alone. MAYER says: "The expression *moving force* is a *pleonasm*, the notion of a not moving *dead force* is a *contradictio in adjecto*. *Supersensuous forces*, and the rest, with all their consequences, belong to the delusive middle region of mysticism."

Prof. WALLING calls, in the first section of his rejoinder, my strictures "a characteristic example of that prevalent inaccuracy of definition, so justly deprecated in your remarks," etc. It is exactly for reason of this inexact definition, prevalent in most text books on mechanics, that I many years ago gave the very definite, accurate, simple, short and clear definition that force is *matter in motion*. I maintain that the text books are inconsistent when speaking of force sometimes as matter brought in motion, as force driving machinery, and sometimes using the word as synonymous with weight or pressure, saying a force of 20 pounds, of one ton, etc. I maintain that the last expression can only stand for a certain mass of matter, of which a certain unit of weight is the measure, and that it can never stand for force. Weight exercises only a pressure, and this must not be called force; it only becomes force as soon as it produces motion in matter. I know by an experience of many years, that most all attempts to produce perpetual motion proceed from the fact that ignorant persons take words for things, and confounding the terms weight, pressure, and force, suppose they have force, when they have only weight or pressure. This confusion of ideas disappears at once when we employ the word force in one signification only, and speak no more of "a force of so many pounds," or of "a force independent from matter," but use it only in the sense conveyed by my simple definition. We can therefore not always substitute "matter in motion" for "force" in the text-books, which, as Prof. WALLING suggests, follows from

my definition; in many mechanical propositions, when the text-books use the word force, I use neither term, but conform the proposition to the new doctrine.

On the other side, I for my part consider Professor WALLING's reasonings as "a characteristic example of that prevalent tendency" to take mere words for the basis of reasoning, which when dissociated from their original rational meaning, convey only an obscure, foggy, imaginary idea, which like an imaginary quantity in mathematics, cannot possibly have a separate existence. *Independent force* is such a word. Professor WALLING attempts to conclude by reasoning that it has a real existence, when dissociated from matter; that it "has direction"; that it even "occupies space," (!) etc. This is about equivalent to an attempt of a mathematician, who should conclude that certain imaginary quantities often appearing in algebraic formulæ, were entities, and may be dissociated from other terms of the formulæ; in short, that they are real quantities, possessing certain properties like other realities in space and time. Indeed the manner in which he arrives at his conclusions is equivalent to the dissociation of motion from matter, as if there could possibly be motion, or even an attempt at motion, or a tendency to motion, when there is nothing left to be moved. Potential energy or latent force includes the idea of matter, in which the energy or force is stored up; in these terms therefore the necessity of associating motion with matter is evident, even if the motion is to take place only in the future; but Prof. WALLING's independent force, entirely distinct from matter, is therefore perfectly identical with that agency about which we heard so much in the so-called spiritual circles, some ten years ago.

In the meantime Prof. WALLING acknowledges in his second paragraph that if my definition of force be correct, the truth of the conservation theory is settled. I rejoice that the Professor sees it, and this being the case I foster hopes that even he will ultimately become a convert to the new faith, as now the whole question turns on this point; if my definition is a *hypothesis*, as the Professor calls it, or if his idea of a force independent from matter is a *hypothesis*, and my simple definition of force as "motion of matter" (either of the mass, or as molecular motion in the form of heat, electricity, etc.) can be sustained by known facts in the universe.

My definition is a direct result of the conservation theory, as is clearly seen; I contest it stands and falls with it; but to understand this conservation theory well requires an extensive course of observation and contemplation. I can do no better than give an illustration borrowed from TYNDALL, which will also answer the questions of Professors HENRY and NORTON. If we heat a piece of carbon or diamond to a red heat, "and then plunge it in oxygen gas, it will glow like a little terrestrial star, with a pure white light. How are we to figure the action here going on? Exactly as you would present to your mind the conception of meteorites showering down upon the sun. The conceptions are in quality the same; they differ only in magnitude, and to the intelligent the one is no more difficult than the other We are to figure the atoms of oxygen showering against this carbon on all sides. They are urged towards it by what is called chemical affinity, but this force made clear, presents itself to the mind as pure attraction, of the same mechanical quality as gravity. Every atom of oxygen, as it strikes the carbon atom, and has its motion destroyed by this collision, assumes the motion we call heat, and this heat is so intense, the attractions exerted at these molecular distances so mighty, that the carbon is heated white hot, and the compound formed by the union of its atoms with those of the oxygen, flies away as carbonic acid gas."

The application of this is, that chemical affinity in regard to the atoms of matter is the same as gravitation in regard to the members of our planetary system; that chemical decomposition, or destruction of cohesion, which increases the distance of the atoms or molecules, is in regard to them the same as is the lifting up of a weight, or in general the counteraction of gravitation, is in regard to our earth; and each requires force to accomplish it. In the case of the decomposition of a chemical compound, which is the overcoming of the affinity of its atoms, a force must be employed equivalent to the heat produced during the combustion; we all know how great the heat is produced by the combination of hydrogen and oxygen, and how strong the equivalent electric current has to be, to decompose the resulting water again into its original elements; in which tnen the force employed is stored up again. The same law is prevalent when destroying cohesion, or when raising a weight.

This is then the answer to Prof. HENRY's question; where the energy goes which breaks the glass, and Prof. NORTON's question; where the force is gone when the pendulum has attained its highest point; in the latter case the force spent in raising the weight is recovered when it descends; in the former the energy which ruptured the glass is recovered by the saving of caloric when restoring its cohesion by fusion. It has indeed been found by me, and perhaps also by others, that it requires less heat for the fusion of a previously finely powdered substance, than if the same substance is heated in one whole mass.

Another very common fact, known to every observant mechanic, is that when saws or drills are dull, they will heat more in using them, than when they are sharp and cut the material. In the first case the force employed is transformed into heat; in the second it is employed in overcoming cohesion. I have here only answered a few of the fourteen paragraphs contained in Prof. WALLING's rejoinder. I may not trespass any more on your space in this number, but will, with your permission, in the future answer the others, and explain how in every case, with, as far as I am aware, only one single exception, we can trace what has become of the force employed.

Professor WALLING could have made out a much better defence of the existence of independent force, by rejecting the atomic theory altogether, and adopting that of the old German Dynamists, who asserted that space is occupied not by atoms but by opposing forces. When, however, adopting the materiality of atoms as he does, and even declaring that he is "gratified to perceive that my views are similar to his, in regard to the function of gravitation in the phenomena of the universe," I do not see how he can still cling to the old notion. We gain absolutely nothing by considering gravitation as the result of another hypothetical force, if the hypothesis of gravitation explains all.

In passing allow me to remark that this idea of gravitation being the prime source of all other forces, even of those of life included, was already fully developed by me in a series of three lectures on Cosmogony, before the American Institute in this city, in December 1866, and January 1867, and published in its transactions. Two years afterwards an article appeared in the *Atlantic Monthly*, advocating the same modification of LAPLACE's hypothesis, that formed the basis of my theory.

I must confess that I do not give much weight to authority, in a subject like the present, in which observation and experiment are open to all; but as Prof. WALLING mentions FARADAY as an authority, I will close this article for the present with a quotation from a paper of his entitled: *Some Thoughts on the Conservation of Force.* He says: "Just as the chemist owes all the perfection of his science to his dependence on the certainty of gravitation applied by the balance, so may the physical philosopher expect to find the greatest security and the utmost aid in the principle of the conservation of force. All that we have that is good and safe, as the steam-engine, the electric telegraph, etc., witness to that principle—it would require a perpetual motion, a force without heat, heat without a source, action without reaction, cause without effect, or effect without a cause, to displace it (the doctrine of the conservation of force) from its rank as a law of nature."

P. H. VAN DER WEYDE, M. D.

NEW YORK, November 1, 1869.

STUDIES IN CHEMICAL GEOGONY.

IN THREE PARTS.

[Read to the AMERICAN ASSOCIATION at Salem, Mass., August, 1869.]

By HENRY WURTZ, of New York.

Introductory Remarks.

These being subjects on which volumes might be written, the whole must needs be condensed, on such an occasion as the present, into a few brief notes, more or less disconnected, as I fear; and to views but partially expressed.

I have long held that the principle which should pervade and strictly govern all researches into the chemical conditions prevalent during past geological time, is to seek out the great natural chemical operations prevalent at this day, and trace them back to their necessary springs and beginnings.

It is true that actual laboratory researches into the characters and composition of the products and relics we possess of those far distant times, are as yet woefully deficient; and before the day shall come when the riddles of the past shall be read, and its many mysteries unveiled, in the light of perfect theory, myriads of laborious researches, both analytical and synthetical, must be made; still I believe that enough has already been done in this field to justify some attempts at generalization. And though these be conceded to be pure hypotheses, still the history of Science establishes the value of such hypotheses, as starting points, in stimulating discussion, and in suggesting modes and subjects of experiment.

I. *On the Prozoic Atmosphere, and the Ocean of the Zoic Dawn.*

It cannot be doubted that it was during the time of the deposition of the earliest sediments of the Ocean, which are known to us now only in the forms of compacted and crystallized metamorphic masses, that life began; and that it had its beginnings in the waters of the Ocean. The exterior Ocean of Atmosphere, though supporting no life in its own bosom at first, I believe to have been then, as now, most intimately and essentially connected, through the medium of the waters, with the life of the latter.

I shall begin by saying at once, and concisely, that my generalizations have led me inevitably to a novel conclusion, which will doubtless startle some; that LIFE was at the outset, has always been, and always must be, the governing *influence* in all chemical changes that have occurred and will occur, in the air, in the waters, and on the earth.

[It is not without a purpose that I here use the word *influence*. The words *force* and *power* I avoid, in laying down this principle, for reasons which I shall give at length on another occasion.]

In a previous paper I have put forth the proposition that at the Zoic Dawn the Ocean must be believed to have been wholly in an oxygenated condition; that is, its constituents were at their maximum of oxidation, What then was the condition of the Atmosphere corresponding to this? Before replying to this, I must first propound another question, which involves an appeal to my fundamental doctrine of tracing back present changes to their beginnings. What, then, is our only known source of oxygen at present? Evidently the decomposition of carbonic acid by solar force, through the influence of plant-vitality; a never-ceasing agency which has continued to increase the proportion of oxygen and diminish that of carbonic acid in the air, since plants began to grow upon the earth, and has left its evidences on almost every leaf of the Book of Geological Ages.

Considering in connection with these facts the nature of oxygen, the greediness with which it enters into combination with other bodies, and applying the doctrine we started with, of following backward to their beginnings all such changes as we find in progress, I am led to lay down, as the primary postulate of a Zoic Theory of Chemical Geogony, the following: The Prozoic Atmosphere contained very little or no free oxygen, probably none; but consisted essentially of carbonic acid, nitrogen and aqueous vapor.

I anticipate of course a host of objections to so novel a view. One is that although plant-growth be independent thereof, yet germination requires free oxygen. Some may even maintain the assumption that plant-life must have commenced with germs.* To this speculative objection one answer is, why? Another answer, probably as speculative, however, as the objection itself; it is far from inconceivable, or even improbable that in a liquid medium containing such oxidating agents as the ferric compounds, the modification of eremacausis thought necessary to germination may have proceeded through the agency of these compounds.

Another objection may be that our present plant-life is accompanied by intermittent intervals of *absorption* of oxygen, during absence of the solar ray. But in any case, the vegetative processes of the day we treat of, were in a measure independent of solar heat at least, if not of solar light also; of which the proof even as late as the Carboniferous, is admitted. To the objection that in the earliest sediments we find little organic, or even carbonaceous matter, I reply that (apart from the graphites and sulphides, both believed organic in origin) it is easily understood that while life might withstand the ferric compounds, dead organic matter would quickly be burned up thereby, the sulphides having indeed resulted from this very burning process. I have applied the same principle to far later times, in a paper presented to the geological section, to explain

* Those who will attach its due weight to the Mosaic Record in this regard, I may remind that the Creative Fiat called for "the herb yielding seed and the fruit-tree yielding fruit after his kind, whose seed is in itself," etc. The question is an ancient one; "Which was first, the hen or the egg?"

the absence of fossils in the American Red Sandstones.

We here recognize another, and by no means a minor source of oxygen, namely, from the original oceanic metallic sulphates, which are now extant as sulphides, having given up their oxygen to the Atmosphere by this indirect process of reduction by dead organic matter. I may add, in this place, that there has been still another, and a quite important source of oxygen, freed through vital influence; that O which represents the proportion deficient in bituminous coals to form HO with the H. This represents of course O which has at first been merely transferred from H to C, but as the CO^2, once formed, is again decomposed and its O set free, it amounts to the same thing.

Certain other objections to my views have been offered to me from time to time in conference and correspondence. With regard to my induction that the Ocean of the Zoic Dawn contained ferric constituents, it has been suggested that these would have been poisonous to life. This is but a question of degree, that is, of the strength of the solution. I claim only that the metals now present in the rocks as sulphides were present in the Prozoic Ocean as sulphates. The solution, in any case, could not have been a concentrated one. Moreover, the notion that ferric solutions are inimical to life, particularly in its lower forms, I think is unsupported by evidence. *Ferrous* solutions are so, without doubt, but not ferric. It has been claimed that subaerial action of carbonic acid, on alkalic and earthy silicates, would introduce into the Ocean enough of bicarbonates to render it neutral, or even alkaline, and to precipitate all ferric oxides and hydrates. No doubt this took place *locally*, and the iron ore beds of these rocks are thus (and I believe thus only) to be accounted for. We have thus actually a new and substantial prop to my theory. Still this is a question of *time*, and to bring the whole of the vast Ocean to a neutral or alkaline condition must have required, as I am convinced, time enough for the deposition of the whole mass of the Eozoic schists, if not of a portion of the Palæozoic. I find that I have been misapprehended, in that I have been supposed to hold, in my paper on Gold Genesis, presented to this Association at Buffalo in 1866, that gold has been deposited from the Ocean equally in all geological ages. By my views, it cannot but be that the oldest sulphides were the most highly auriferous, at least of those (if any such there be still in existence) that have been deposited from the oceanic menstruum directly. It is *Gold-Concentration*, and the formation of gold veins, that I claimed has occurred throughout all time, and is even now going on; and going on by virtue of the same agencies that I was the first to discover in 1858, the alternate formation, by oxidation, from auriferous pyrites, of ferric solutions of gold, and their reduction to ferrous conditions again, by further reactions with unaltered pyrites or with organic matter.

My further notes on this branch of my subject must be cut very short.

From the above it will be seen that my reasonings have led me to believe that in Prozoic times, all the oxygen of the earth which now enters into the processes and changes going on upon its surface, all the *potential* oxygen of the earth (so to speak) was locked up in combined forms and divided between the earth's hydrosphere and its aerosphere; combined chiefly with iron in the former and with carbon in the latter.

I would next present the proposition that substantially all the potential *chlorine* was contained in the Prozoic, as it is in the present Ocean; as we know of no method by which chlorine (not probably oceanic) is now being introduced into the Ocean. As to *sulphur* and *phosphorus*, it is not certain that these two were *all* in solution in the original Ocean, as the fundamental rocky substratum or nucleus of the earth's crust being even at this time unrecognized, there is no certainty that it did not contain sulphides and phosphates before its subaerial erosion began. It is clear, however, that *most* of the sulphur, and probably of the phosphorus, of all sedimentary rocks was in the earliest Ocean, in acid forms. This Ocean then contained not less combined acids than ours.

[To be continued.]

The anthracite coal-fields of Pennsylvania, comprised in six counties, underlie 470 square miles of mountain and valley, and, so far as yet discovered, contain the only anthracite deposits of the continent. More than $40,000,000 has been absorbed in mining capital, and about the same sum in canals, and $70,000,000 in railroads, constructed almost solely as a means of transportation for coal. In the whole anthracite region there are about two hundred firms and incorporated companies, which have sent into the market during the past year about 16,000,000 tons of coal. Of the market production nearly 6,000,000 tons were sent by the three great companies—Delaware, Lackawanna, and Western, Delaware and Hudson, and the Pennsylvania Coal Company.

A New and Economical Method

FOR EFFECTING THE EXTRICATION AND CONDENSATION OF AMMONIA FROM GAS LIQUOR

For Purposes of Cheap Carriage, and for Facilitating the Manufacture of Ammoniacal Salts.

[Read before the British Association, Exeter Meeting, Section C.]

By Fredrick Braby, F.G.S.

It is but a very few years since that the various bye-products obtained from the manufacture of coal gas were not mearly a drug in the market, but proved an absolute nuisance to the manufacturer and to the general public.

Coal tar was even burnt under the retorts, or was introduced therein for the production of gas; and gas liquor was commonly given away to any one whose ingenuity might enable him to turn it to a useful purpose.

But the progress of science in this, as in other cases soon discovered applications where none were supposed to exist.

From coal tar are not only now obtained naphtha, benzole, carbolic acid, and other valuable derivatives, but also the brilliant and diversified colors of what are called aniline dyes are obtained from the same source. The ammoniacal liquor, too, to which, on the present occasion, I desire to be favored with your attention, is now not only not given away in the metropolitan and other districts, but, in certain localities, the greatest competition exists for its acquisition. It at present constitutes, in this country, the principal source of ammonia, and consequently, of the ammoniacal salts, which are so usefully and so successfully applied in the arts, and more especially to agriculture. In London and its neighborhood, the purchase of the residuary products of the various gas companies is eagerly sought after, and it is now considered a privilege to be allowed permission to tender for them for one, two, or more years, supply. Practically, the tar and gas liquor trade is in the hands of a few parties jealously desiring to exclude outsiders, who thus find it extremely difficult and often obsolutely impossible to obtain even a few thousand gallons.

The object of the present communication is to show how the demand for gas liquor which so far exceeds the means of actual supply can be met. It is to show, moreover, that by condensation and reduction of bulk for transport, small and remote gas works may be enabled to utilise and export their residual products at a profit; and above all, how, by the introduction of certain improvements, the quantity of ammonia as produced and utilised from the manufacture of gas, may be practically increased from ten to fiftyfold.

The strength of gas liquor is commonly specified in the various tenders as technically 6 oz. The prefix, denoting the number of ounces, refers to each gallon of the liquor, and does not signify the number of ounces of ammonia that are present, but the number of ounces of sulphuric acid which would be required to neutralise the ammonia. Consequently a butt of 108 of 6 oz. liquor implies, by calculation, that 108 times 6 ozs. or 40 lbs. of sulphuric acid are required to saturate the whole quantity. Now it is found in practice that, if we divide the quantity of sulphuric acid reqired by 3, we shall get at the quantity of ammonia actually present. This result closely agrees with theory, the equivalent of dry ammonia being 17, and that of monohydrated sulphuric acid (oil of vitriol) being 49; the proportion is very nearly 1 to 3. It follows, therefore, that, as 40 lbs. of sulphuric acid are required to saturate a butt of 7 oz. liquor, so one-third of this or little more than 13 lbs. of real ammonia are contained in this immense quantity of liquid and merchantable product, weighing as it does in the aggregate no less than 1107 lbs., or one half a ton. On refering to the ordinary commercial standard, viz, 6 ozs. to the gallon, 6 ozs. of sulphuric acid divided by 3 gives 2 ozs. of ammonia as the entire quantity present, Now a gallon of the gas lipuor weighs 10 lbs. and, if the lbs, be multiplied by 16 to reduce them to ounces, we have a total of 160 ozs., containing only 2 ozs. of real ammonia or 1 oz to 80 ozs. of water.

The result of this is, practically, to prohibit the transport of gas liquor over any but moderate distancee because, in its present form, for every ton of real ammonia carried by barge, tank-cart, or otherwise, no less than 80 tons of water must be carried for no other purpose but as a solvent. It must not be inferrd, however, that the *whole* of these 80 tons of water is waste carriage Ammonia in a free state connot be conveniently carried, except when dissolved in a certain quantity of water It would not be judicious to consentrate the ammonia to a higher degree than 0·900, since if, in course of carriage, it were subjected to any great degree of heat, the water at an elevated temperature would disengage some of the NH_3 held in solution, and such a disengagement of ammonia might be attended with dangerous results. A very useful and safe solution for all purposes of transit would be about one part by weight of ammonia to four parts of water; this would reduce the present cost of carriage for this important artical to no less than twenty times, or, in other words, the transit of a certain quantity of ammonia over a certain distance costing now £20 would if conveyed in the above consentrated form, be reduced to 20s. This scale of reduction would at once enable it to be carried by rail in petroleum or other barrels, or in tank trucks, or otherwise, and would bring the numerous gas works which are scattered over the United Kingdom within economical transport of the centres of manufacturing industry, so that this important bye-product of gas making might be utilised for the general good, and be not so extensively wasted as has been, and is now, frequently the case.

In order to effect this desirable object, I recently, in conjunction with Mr. Bagge, secured a patent for effecting the necessary concentration of ammonia by certain novel means, which promise in practice to prove far more rapid and economical than any hitherto employed. The process may be shortly described as follows:—To the common ammoniacal gas liquor a certain quantity of slaked lime is added. The liquor thus treated is placed in a capacious boiler or still containing from four to five thousand gallons. The whole is then heated and maintained at a temperature of from 100° to 200° F., the liquor being slowly but constantly stirred by means of an internal aligator, the spindle of which passes through a stuffing box in the end of the boiler. A powerful blast of air from a double-action force-pump actuated by a small steam engine or otherwise, is blown continuously through the liquor. The air enters by two long perforated pipes placed near the bottom of the boiler, and in its upward passage it is compelled to pass through a horizontal diaphragm drilled with numerous small holes. The result of this arrangement being that the air, in its ascent, is subdivided into innumerable small sheaves and bubbles, to each and all of which, in accordance with well-known and recognised laws, the ammonia attaches itself and is carried away with only a very small proportion of acqueous vapor. An exit pipe is fixed to the top of the boiler, so as to carry away the mixture of air and ammonia, and the extremity of this pipe dips into a supply of water contained in a cold and suitable receiver, where the ammonia is immediately absorbed, and the air after thus effecting its removal in a separate state, escapes through the water and is permitted to pass off into the atmosphere. The condensers are generally arranged like a series of what are known as Woulfe's bottles, but for the purpose of obtaining great strength and purity, this arrangement may be superseded in the manner following.

The ammoniacal gas separated by the air is purified in a manner which will be afterwards described, and is then caused to pass into a vessel about three parts filled with broken lumps of pure block ice. From the well-known affinity of ammoniacal gas for cold water the gas is arrested by the ice, which is rapidly liquefied, and a pure solution of ammonia of any required strength is obtained. It is advantageous to cool down the mixture of air and ammoniacal gas before it is allowed to enter the condenser; the air after having parted with the ammonia which has been dissolved by the liquefied ice, passes off into the atmosphere as in the former instance. The finest Norwegian transparent block-ice may, in the height of summer, be obtained at the London Docks at 23s. per ton, and even less, according to the number of tons required, the supply being constantly maintained by the arrival of fresh ships. Or ice may be obtained by one of Siebe's refrigerating machines almost as cheaply as that which is imported.

This patent process for separating the ammonia by blowing air through gas liquor when at an elevated temperature, is so much more rapid in the operation than the process of merely boiling the gas liquor as hitherto conducted that, with a very moderate-sized apparatus, several thousand gallons of gas liquor can be treated in a single day, and the ammoniacal produce of the largest works may be continuously converted into a concentrated and more portable from without trouble or delay. Even in the smallest works, consuming not more than from ten to fifty tons of coal a week the bulk and weight of the gas liquor may be quickly reduced, and the result will be of such standard value that a still containing from 20 to 100 gallons would, probably, in such cases, answer every desired purpose, and would be found to be remunerative. In many instances the gas liquor might be heated and the power supplied, if desirable, from the waste heat of the retorts.

By the adoption of this improved process the present trade in crude ammonia may be expected to expand and to become of higher importance than it now is.

The comparatively limited supply which is now available restricts its application. The comercial advantages which would be derived from the many technical purposes to which it is applicable would be considerable and manufacturers being enabled to obtain

cheap supplies from distant sources, the total quantity utilised would be immensely increased.

When, instead of producing caustic ammonia it is desired to manufacture ammoniacal salts, the ammoniacal gas in conjunction with the atmospheric air may be conducted into sulphuric or muriatic acid, or into a metallic or saline solution capable of appropriating the ammonia.

As the evaporative power of air increases with the absence of moisture therein, it is possible that, by drying the same artificially before introducing it into the liquor, it would take up a great quantity of ammonia. The removal of all moisture from air may be effected with comparatively little expense by the suction of the air required for the force-pump through sulphuric acid, and a close wooden box containing lumps of chalk. This method is well known in connection with other applications.

The blast of air may be hot or cold, and may be delivered in any manner adapted to increase and effect more intimate contact between the air and the liquid containing the ammonia.

By adopting what I call the atmospheric or blowing principal, nearly the whole of the ammonia can be liberated from the solution in which it is contained, without any fire or external heat applied to or under the still or boiler, but, if the liquor be heated, the solubility of the alkaline gas is diminished and its extrication is facilitated.

Gas liquor is, in this country, the most common, and at the same time the most economical, source of ammonia, and the system of extrication by forcing air would, of course, be equally applicable to ammoniacal bone liquor, or to any other chemical preparation in which the caustic ammonia is held in solution.

[To be continued.]

Our City Sewerage.

WHAT THE BOARD OF HEALTH AND THE CROTON BOARD ARE DOING

In the administration of civic affairs there is no subject of more importance to the welfare of a city or the health and comfort of its population than that of drainage and sewerage. In the large cities of the Old World the history of their progress demonstrates the truth of this assertion, and the vast sums which have been and are still being expended to remedy the errors of the past show the alarming condition to which, through years of neglect, they had at length arrived.

In this great city with its densely populated wards, the unsystematic manner in which the sewerage has been managed has already resulted in the outlay of hundreds of thousands of dollars, with no preceptible result, as well as being a deep-seated agent of disease. The mortality list of New York has been greater in proportion to its population than even the older cities of Europe, and the numerous contagious diseases that have swept over the island in years past may be attributed in part to the dilapidated and illy constructed drainage channels. There are already more than two hundred miles of sewers under our streets, nearly all of which have been built without any regard to system. To correct or even lessen the evils resulting from so many years of mismanagament is a task which will require much study and time, as well as an enormous outlay of the money of the people.

SEWERS ABOUT THE PARK.

In the upper portion of the city where sewers have been laid the engineers or those to whom this business has been entrusted, have sadly neglected to study the lessons of the past, as the sequel will attest. Numerous small streams fed by underground springs have their source near the park and empty into the North and East rivers after meandering in different directions. Since the limits of the city have extended up so far, these streams have been filled up with the garbage and refuse of the streets and the new made ground brought up, divided up into lots and sold to speculators. The subject of sewers was the last thought of, but in time they were built, but in a manner that should call the attention of the taxpayers. In the first place they were not deep enough; secondly, they were built of inferior material, and lastly the sewers in several streets will have to be taken out entirely, which will involve an expenditure of the city of between $75,000 and 100,000, when, if they had been properly constructed in the first place, all of this expense and trouble would have been obviated.

STAGNANT WATER IN VACANT LOTS.

The people are indebted to the indefatigable efforts of the Board of Health for ferreting out these cesspools of disease. It is estimated that there are at present 100,000,000 gallons of stagnant water in lots between Sixty-fifth street and the park, which the sewers are incapable of draining by reason of their inferior construction and limited capacity. These lots are always filthy in summer, and frequently blocked up with snow in winter and the very material which is used to fill in will form a nucleus for disease as soon as the warm weather comes again.

DOCTOR VIEL'S REPORT TO THE BOARD OF HEALTH.

During the month of April of the present year the attention of the Board of Health was called to this condition of affairs by Dr. Viel, whose efforts, as a member of this Board, deserves the gratitude of all. The following is his report of the condition of the grounds and sewers:—"Throughout the sanitary district under my charge there is a great accumulation of standing water. In many places this water has become stagnant and very offensive in consequence of the refuse matter which is thrown into it. I have on several occasions called your attention to the subject in reference to particular localities, where the pressure of decomposing animal and vegetable matter called for prompt action, to avoid serious injury to the public health. Since the cause of the evil is so widespread in its nature as to demand the application of a remedy, both permanent and general in its character, I refer to the subject now in order to bring to the notice of this Board the condition of the property immediately adjoining the park and lying between Fifty-eighth and Sixty-fifth streets and Fifth and Lexington avenues. These lots are filled with water ranging from three to fifteen feet in depth. These blocks lie in the course of one of the original drainage streams which, rising near the antilinal axis of the island, flow through devious courses into the North and East rivers. Originating from perennial springs, these streams receive in their course an accumulated supply from numerous other springs, and when, as in every case under my observations of street construction, their course becomes obstructed, the consequence is that a large area becomes flooded and the ground permamently saturated. Within the last five months additional obstructions in the free flow of water have been suffered to be made, the ground which has never been wet before is now overflowed with water. This has been a serious neglect which will be felt for years to come. Yet there is a remedy."

REMEDY SUGGESTED AND HOW ACTED ON.

The doctor suggested the building of deep drains beneath the old sewers and the beds of the filled in streams, which would drain this accumulation of stagnant water. His suggestion was immediately acted upon, and a resolution was introduced by the Superintendent of the Board of Health requesting that the Croton Board, if they value the lives of thousands residing in the upper part of the city, to remedy in some manner the evils. To this resolution the Croton Board replied that the sewers erected were ample for all that was required of them, and that they should do no more, exhibiting at the same time an utter disregard for the health and welfare of the city. Not to be thwarted, the Board of Health consulted with Mr. Eaton, their counsel, and after satisfying themselves that they had the power to go ahead in the matter, instructed their engineer, W. A. Worthen, to draw up plans of the grounds and the requirements. This gentleman reported that large and deep drains, built of substantial masonry, were necessary to be built at least five feet below the bed of the old sewers, extending through Sixtieth, Sixty-first, Sixty-second, Sixty-third, Sixty-fourth, across Madison avenue, and from Fifth avenue, at the junction of Sixty-fourth street, to the sewer at the junction of Sixty-ninth street and Fourth avenue, which report was accpted and men set immediately to work. At this stage of proceedings the members opened their eyes to the true state of affairs and generously came forward and extended the right hand of fellowship to their brethern of the Health department.

BRIGHTENING PROSPECTS.

The Board of Health have a grand scheme in contemplation in regard to the regeneration of all the sewers running through important thoroughfares, as well as those in localities where disease mostly predominates.

Manufacture of Illuminating Gas From Coal, and the Utilization of the Waste Products.

The following article forms but a small portion of the voluminous report on "The Progress and Condition of Several Departments of Industrial Chemistry," by A WRENCE SMITH, one of the U. S. Commissioners to the Paris Universal Exposition, now published by the Government printing office at Washington, which we doubt not will be read with interest by the gas fraternity:

There is not any substance which, in the last forty or fifty years, has produced such wonderful results in the developments of the arts, commerce, and industrial pursuits, as coal. It is not, however, our province here to refer to its applications in metallurgy and the other arts in which direct operation brings about the required results; but to confine this and the following chapter to the industrial products obtained from coal by operations more or less indirect.

I had drawn up a report based on the results as exhibited in Paris in 1867, but it was so extended and hastily digested that it has been discarded, and in its stead I have combined my report on gas and gas materials, as made out for the jury reports published by the Imperial Commission, with the admirable lectures of Dr. Letheby on the articles made from coal, and have appended an extract from the report of Dr. Hoffmann.

PROGRESS OF THE ART OF GAS-MAKING.

Important progress has been realized in the manufacture of gas—more, however, in reference to giving stability, and to perfecting apparatus already employed, than in the discovery or application of anything new. The importance of this industry is manifesting itself every day, not so much in the direct products for illuminating purposes, already so well established, but from the great number of valuable and beautiful products resulting from the treatment of the residues by the chemist.

We have become so accustomed to the use and production of illuminating gas from coal that, like most things we are habituated to, the great value of the product and the importance of the industry, as well as everything else connected with it, is lost sight of alongside of more glaring and recent discoveries of far less magnitude; yet if we review the origion and development of this industry, and the direct and indirect effects of it upon the advancement of the age, it is certainly to be ranked as one of the most important inventions of the present century, and second only to that of the steam-engine.

Its direct effect is to convert night into day, to make the short and obscure winter days equal to those of summer, giving more time to those occupied with indoor pursuits, and enabling them to conduct their labors with less fatigue to the eye and with more certainty of execution. In this aspect alone the immense wealth that has been added to the industrial arts is incalculable.

In its indirect effects, the use of coal gas has benefited society by saving vast tracts of land for other agricultural purposes that would have to be devoted to the cultivation of plants furnishing oil and fatty matters to be used for illumination; and besides, there have been saved for other purposes hundreds of ships and thousands of seamen that would be required for the whale and other fisheries carried on simply for the purpose of procuring oily matters to be used for furnishing light.

Regarded as a luxury, its benefits are not to be dispised, for it has cheapened many of them to such a degree that both rich and poor are equal participants of them. Our brilliantly lighted streets are evidence of this fact, so that the people traverse our cities with the same ease and security at night as in daytime. And here we may again allude to another fact in connection with the manufacture of coal gas, namely, that the offensive residues which are the natural results of gas making have been made to give rise to most important industrial pursuits, employing a large amount of capital and accumulating wealth. Coke, ammonia, pitch, and tar have been for many years drawn from this source; but it has been left for the more recent developments of chemistry to extract from the tar, by processes more or less indirect, beautiful crystalized compounds used in giving to silk, woolen and cotton, colors that rival in brilliancy the hues of the rainbow; and this discovery in its turn reacts on the manufacture of the various textile fabrics. All of these facts will be most fully developed in the report on coal colors, by Prof. Hoffmann, to whom we are indebted for the first and most important steps in their manufacture.

It is not the design or province of this report to go into the historical details of the origin and development of this industry. Like many other great discoveries, the world was prepared and looking for it. The minds of many were occupied with it, and the distinguished Scotch philosopher, Dr. Chalmers, "at a time when the streets and lamps of all great cities were lighted and burnt in lamps, held that the time was not distant when a carburetted hydrogen gas would be substituted instead, and on getting his house repaired he actually introduced into the walls of the house a system of tubes and pipes for the passage into the various rooms of the gaseous fluid yet to be employed as the illuminating agent." But among all the vague speculations and ingenious devices, there were two individuals endowed with skill and practical minds, who were giving shape and form to them—Murdock in England, and Le Bon in France. The combination, however, of circumstances favored the former, and I think no impartial investigator of the subject will fail to render to William Murdock, of Redruth, Cornwall, the sole merit of the practical application of coal gas to the purpose of artificial illumination, in about 1800. And it is a noteworthy fact that this discovery was first exhibited publicly as a rejoicing over the hush of war and the renewal of peace, on the occasion of the grand illumination in England commemorative of the peace of Amiens, in 1802.

Since the commencement of the century to the present time the industry of coal gas has been gradually improved, and the mixed nature of this compound has been more and more simplified, rendering the illuminting gas better adapted for the purposes to which it is applied; the condensable products and impurities are better removed, and the latter, in their turn, made to subserve some useful purpose, until the gas manufacturer receives the coal from the mines and sends forth nothing that is useless.

In the systematic review of the gas industry and products resulting therefrom, so far as regards its more recent improvements exemplified by the great Exposition of 1867, the remarks will be confined especially to what was there exhibited.

MATERIALS USED FOR MAKING ILLUMINATING GAS.

The Exhibition does not furnish anything new under this head. To sum up what is now known can be done in a few words.

The materials now used in the manufacture of gas may be comprised under the following articles: coal, wood, pitch, rosin, oils, fats, and petroleum. There are also other vegetable and animal products which have been suggested, and even employed, on a small scale, as bones, etc. But of all the raw materials there are none which can compete with coal, except under some extraordinary combination of circumstances; for not only does coal furnish gas more economically, but it affords valuable residues, producing a fuel necessary for its formation in much larger quantity than is required for that purpose, and other important refuse matter, as tar, ammonia, etc. The question in regard to the substitution of petroleum for coal is not worth serious consideration at the present time. It may be advantageous occasionally to add, in a convenient manner, some petroleum when this is abundant and the coal used requires the addition of a material to furnish gas of a high illuminating power; then from twenty to thirty gallons of petroleum to 2,000 pounds of coal may become desirable. Pitch and rosin, when cheap, may be added to coal for the same purpose. All other adjuncts, as vapor of water, etc., serve only to dilute the gas and make it of less value. Bituminous coal, under its various forms, has not found a rival, nor is it likely to encounter any for a long time.

The following fact may be mentioned in connection with the manufacture of gas from wood. In those countries where this material is abundant and coal not accessible, wood, aided by the addition of some substance furnishing a rich hydro-carbon, may be made to furnish a very useful illuminating gas, and an economical one, especially when the residue in the retorts and material distilled with the gas can be rendered servicable. In Coburg, Canada, it is said to have been used advantageously, furnishing a good gas and a valuable residue. viz:

Two parts pine wood.
One part hard wood.
One part bones.

The residue in the retorts is an excellent charcoal for bleaching purposes, and the other residues are quite serviceable. Where bones cannot be obtained, offal and other coarse animal matter can be used to mix with the wood. This suggestion is worthy of consideration, especially for many small towns peculiarly situated.

[To be continued.]

Torpedoes in War.

The Professor of the art of human slaughter are especially anxious to perfect "the torpedo." The bottoms of ships are their weakest part, and there is scarcely an ironclad afloat which has not a more or less soft belly like an alligator; hence the idea of the attack from below. The difficulty is, however, that the enemy's fleet will not always sail exactly where one wishes; while, if the submarine mine explodes anywhere but under her bilge, it might as well be a Chinese cracker, thrown at her by a boy. An enthusiast in destructiveness, Lieutenant Lupis, of the Austrian navy, thinks he has hit upon a way of making the torpedo go straight at the enemy's ship, and explode by striking it. This feat had been achieved before, although imperfectly. The Confederates for instance, used to float two torpedoes down the tide, fastened together with a cord, which, when it caught upon the chain cable, brought the explosive arrangement against the bows of the vessel with force enough to ignite a cap and fuse. But Lieutenent Lupis is a marine artist; he has seen, and he seeks to emulate, Nature's own productions. With dashing contempt of zoological clasification, he constructs his "torpeto" in the shape of a dolphin. His iron fish is fourteen feet long, and sixteen inches thick with vertical and horizontal fins of metal to keep it floating correctly. Into the head of this infernal animal he stuffs sixty pounds of compressed gun-cotton, with a number of iron plugs, like the bolt of the pin-cartridge, sticking out. The belly is filled with air compressed to thirty-five atmospheres: and this motive power works a screw which projects under water at the tail, giving a spread through the first four thousand feet in the water of not less than eight or nine miles an hour. The lieutenent launches his interesting creation from a long tube, which enables him to give it a definite direction toward the enemy's ship, and even if it merely impringes upon that mark, some one of the pins or bolts is sure to be driven into the charge. In that case, as the lieutenent and his friends firmly believe, any vessel so struck would disappear in the water with all hands, Practical mechanicians may be surprised to hear that the Lupis dolphin really does go uncomonly straight for a thousand feet, and is much admired by the connoisseurs of belligerency at Trieste, where it has been tried; nor can there be any doubt that a shoal of such odd fish coming out altogether from an enemy's defenses about a vessel's hull, and showing no more than an iron back fin above water, would be as disagreeable, since the amiable lieutenent talks of filling the brain-pans of his metallic dolphins with nitro-glycerine; in which case, if he himself should not be prematurely annihilated, and if the smallest of his shoal only hit the mark, any man-of-war afloat would be sunk like a bark canoe.—*Leslie's Illustrated News.*

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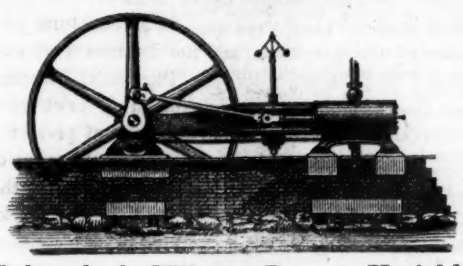

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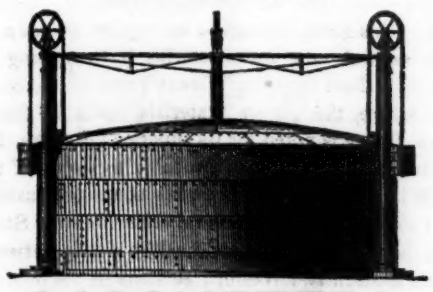

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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

TUESDAY, NOVEMBER 16, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. News-dealers will please send orders to them.

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TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

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The New Haven *Palladium* learns that Professor Whitney has been called to the chair of comparative philosophy at Harvard College, with a salary double that which he receives at Yale.

BRICK AND BRICK MANUFACTURE, ETC.

The manufacture and use of brick is of very ancient origin. They were used for architectural purposes by the Egyptians, and the Israelites were employed to make them for the Pharioh's. Roman and Greek monuments constructed of brick have come down to us in a remarkable state of preservation, as daily discoveries in excavating the ruins of Herculanenum and Pompeii go to show. In the East and in Spanish America they bake the bricks in the sun. The Mexican sundried brick composed of clay and straw, is something wonderful in size and appearance, being sometimes 2 feet long 1 foot wide and four inches thick.

Our Encyclopedias inform us that brick is an artificial preparation of clay, sand, and ashes burned in a kiln, or clamp, and used for building and other purposes.

Brick earth is also sometimes found in a natural state. In this country there have been discovered and opened many valuable deposits of common brick clay for building, as well as fire-brick clay, of exceedingly good quality.

Holland and England have been most famous in modern times for producing superior brick, and especially fire-brick, and the importation to this country has been, until recently, very large.

Domestic brick have always been made and used in this country for building; but the manufacture of *fire-brick* has not obtained largely until more recently. The last 10 or 20 years have seen remarkable advances made in that art, and to-day we produce an article superior to any other part of the world; and as a branch of industrial manufacture it is rapidly assuming colossal proportions.

Great improvements have been made in brick making machinery, which by the aid of steam and other power, greatly lessens the manual labor. There is Stephen Ustick's patent machine for moulding and pressing brick, by a system of fillers and cams which automatically moulds and presses the brick. There is Messrs. Choice & Gibson's machine which works the clay and "*chops* out" the brick by a falling mould box, many at a time. There is Leahy's and Nash's rotary and double rotary mills and machines, which roll out the brick, as it were, with great rapidity. There is Carville's machine which kneads the clay and presses it in a series of moulds running on an endless chain. There are Whipple, Riddle, Capouillet, and many others whose inventions are meritorious in various specialties.

Fire clay and fire brick, etc., are staple articles in this country, and the demand is constantly increasing. This gives impetus to enterprise, and as a result several new manufactories have sprung up within a short time, in different parts of the country, where the proper materials could be found. New Jersey is noted for its superior fire-clays, but Pennsylvania is destined probably to carry off the prize in that line. Ohio makes some pretensions, and also Missouri, and several other Western State, and there is a growing and healthy rivally between these Eastern and Western sections in the production of fire brick, crucibles, retorts, etc.

MESSRS. WILSON & GARDNER.—These gentlemen have recently established works at Lockport, Westmoreland Co., Pennsylvenia, for the manufacture of clay retorts, fire brick, tiles, etc.

The different qualities of clays found in this locality are very superior, both hard clay and the soft clay, and are perfectly adapted to mix (the hard and soft) in such proportions as are best calculated to produce a durable brick or retort, without the necessity of first burning the soft clay to make it hard enough to mix as is generally practiced by manufacturers, and which, of course, considerably enhances the cost of manufacture.

The analysis of the clays of this section prove that they are in composition and character quite equal, and even superior to any of the foreign clays which have so long been imported into this country. Our own observation and knowledge of these clays is decidedly favorable.

These gentlemen may well be congratulated, owing to their central location and excellent facilties for transportation, and the manifest advantages they possess for manufacturing at low cost, a superior article of fire brick and retorts, etc.

MUNICIPAL CONVENIENCES.

The New York *Times* of the 15th has some severe but true remarks upon the indifference and apathy manifested in this city, by the "powers that be," in introducing valuable improvements, intended to be of great advantage to social progress, and the benefit of the municipality generally. After refering to the much talked of but non-appearing Hansom Cabs—the Underground Railroads—Pneumatic Express Scheme, and City and Local Letter Express and Telegraph projects, it says, thus:

"Another illustration of this same indifference to progress and improvement is shown in the practice of the gas companies in lighting the street lamps. For long years, the lamps in European cities have been lighted by thrusting up into the lamps a shaded torch, the movement which raises the valves at the bottom of the lamp also turning on the gas, the operation being literally quick as a flash. Here labor is far dearer than in Europe, and yet it is only recently the Manhattan Company has begun to use the touch-bearer. The Metropolitan Gas Company still sends round a man with a ladder, which he plants carefully against the lamp post, climbs laboriously up it, gets a match out of his vest pocket, scratches it on the iron pillar, and then, turning on the gas with one hand, lights up with the other—the process taking about three times as long as the new one, and carrying all who see it irresistibly back, not exactly to the middle ages, but to the early part of the century."

[This improved method of lighting street lamps referred to by the *Times* in the above, is the same which we have called the attention of those interested in lighting street lamps to, as being the best, and a great improvement over the old method. Full particulars of the same may be obtained from Mr. J. W. Bartlett, 569 Broadway, New York, who is the proprietor of the patents, and whose advertisement appears in our paper.—EDS.]

OBITUARY.

THE LATE PAUL A. SABBATON.

We most sincerely regret having to chronicle the death of the eminent gas engineer, Paul A. Sabbaton.

Few men have been distinguished in their career by greater enterprise, or by more inventive resources and energy, than the late Mr. Sabbaton. Though a native of France, he was a true patriot and loyal American. Mr. S. was but 13 years of age when he left France to avoid the conscription. Upon his arrival in this country at the age of 13, he was sent by his uncle (a French importing merchant) to a school in New Brunswick to learn the English language. Here he remained until he was 17 years of age, when he went into the office of his uncle, who afterwards purchased the "Mercantile Advertiser," and continued its publication with Amos Buttler as partner.

Mr. Sabbaton continued in the office several years; afterwards he turned his attention to the iron business, which he continued successfully until the disastrous year, 1837, when, in consequence, of numerous failures in N. Y., he became also involved, and soon after turned his attention to the manufacture of gas, in which business he continued until his death.

He was a close friend of Fulton, and drew the specification and prepared the plans of the first steamboat on the Hudson. In the war of 1812, he held the government contract for supplying shot and shell, and erected the works at Cold Springs.

In all the relations of life, few men leave a fairer record. His mind was enlarged by general reading, and there were few subjects upon which he was not conversant. His nature was affectionate and generous in the extreme. Modest in his deportment he was only appreciated by those who knew him best.

At a meeting of the Board of Directors of the Albany Gas Light Company, held at their office on the 4th day of November, 1869, the following resolutions were unanimously adopted:

"The death of Paul A. Sabbaton, the Superintendent and Engineer of this company, is deeply lamented. To his ability and careful attention this company owes much of its prosperity. To his merit as as an able officer, were added those qualities personally which endeared him to the members of this board, and to his friends. He was a man of rare acquirements in his profession, of high integrity and agreeable and urbane in his personal intercourse. He closes his career on earth after a long life of usefulness, without a strain to mar his record as a useful citizen, and an honest man.

This Board sympathizes deeply with the family in their affliction, and, to mark their respect, will attend the funeral in a body.

The Secretary is directed to communicate these resolutions to the family of the deceased and to publish the same."

B. PUMPELLY, President.
B. HUMPHREY, Secretary.

"PUT MORE MONEY INTO IT"

It is said that many years ago the Proprietor of the *American Agriculturist* asked a friend of his, an old experienced publisher, how he should promote the welfare of his journal. After sundry remarks, to the effect that people would in the long run patronise that journal which really contains the most valuable reading matter, and that the only way to secure this was to spare no labor or expense in obtaining the *best* men and the *best* information that money would buy, his friend closed by saying he would sum up his advice as to the way to make the *American Agriculturist* the best and most popular paper in the country—under three heads, viz: "1st. *Put money into it.*—2d. *Put more money into it.*—3d. *Put some more money into it.*" That advice seems to have been followed. No other monthly journal or Magazine is got up at greater expense of labor and money than the *Agriculturist.* Every page shows this. Its beautiful, pleasing, and instructive Engravings cost about *one thousand dollars* in each number! Its ample pages are filled with carefully prepared reading matter, abounding in information useful to all classes, whether in City, Village, or Country. A large force of the best practical men and women are constantly employed in gathering, and sifting, and condensing information. Yet while prepared at a cost exceeding that of the $4 and $5 magazines, the *American Agriculturist,* owing to the large patronage it enjoys, is supplied at $1.50 per annum, or four copies for $5, and at still less to large Clubs. And those subscribing now get the paper from date of subscription to the end of 1870 at the price of a year. We advise all our readers to avail themselves of the opportunity, and subscribe now. They will find it a good investment. The Publishers are ORANGE, JUDD & Co., 245 Broadway, N. Y. City.

☞ TO OUR PATRONS.—We must offer an apology for an oversight that occurred in our last issue, in the press work. The greater portion of the sheets were backed wrong so that the folios did not run in their regular order. By commencing at folio 130 and following the paging this will be eliminated.

Answers to Correspondents.

M. A. Co., Newbern, N. C.—H. Q. Hawley, Albany, N. Y., is agent for Aubin's Gas Works. We have no knowledge of the other party mentioned. Geo. H. Kitchen & Co., 591 Broadway, also erect gas works for rosin.

L. B. E., Pittston, Pa.—The average loss of gas by condensation and leakage, between the gas works and consumers, is from 10 to 15 per cent.

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The proposals, addressed to the undersigned, must be sealed and endorsed "Proposals for Coal Tar." They must state the offer for the Tar at a price for each ton of Coal carbonized at the Works of the Company. The quantity of Coal carbonized per annum is about 140,000 tons, and the average yield of Tar per ton of Coal is about 12 gallons. The Company do not bind themselves to accept the offer of the lowest, or any bidder.

Any further information may be obtained, on application to,

JOSEPH A. SABBATON,
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References to the President Hartford City Gas Company. Address, "GAS ENGINEER," office, 128 Main street, Hartford, Conn.
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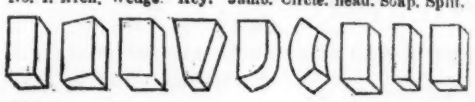

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TO GAS COMPANIES.

SITUATION WANTED BY A MAN OF THIRTY, as Superintendent of a small or medium sized Gas Works, in any part of the country. Is a good accountant, and thoroughly understands the business. Compensation moderate. Address,

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Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

THOMAS PRATT,
587-6m Sup. St. Louis Gas Works.

DUNBAR'S
Gas Retort Setter's Guide,

Or how to set a Bench of Betorts, 14 x 22, 8 feet 7 inches long, that may be worked up to a capacity of 7000 feet per Retort in 24 hours, with the various sizes of Retorts, producing the like results, or 6,500 feet per Retort a day, on an average, for six months.

With specific instructions how to successively manage the same, so as to obtain like results for six and twelve months more, thereby creating a great saving in capital and labor. Also, instructions how to burn your own Lime in a vacant oven.

Having 13 year's practical experience in Retort room, and management of Gas Works, I feel that I have attained that proficiency which will enable me to make the Work of great value to the profession.

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[Extract from testimony from Suprintendent Chelsea Gas Co., Mass.]

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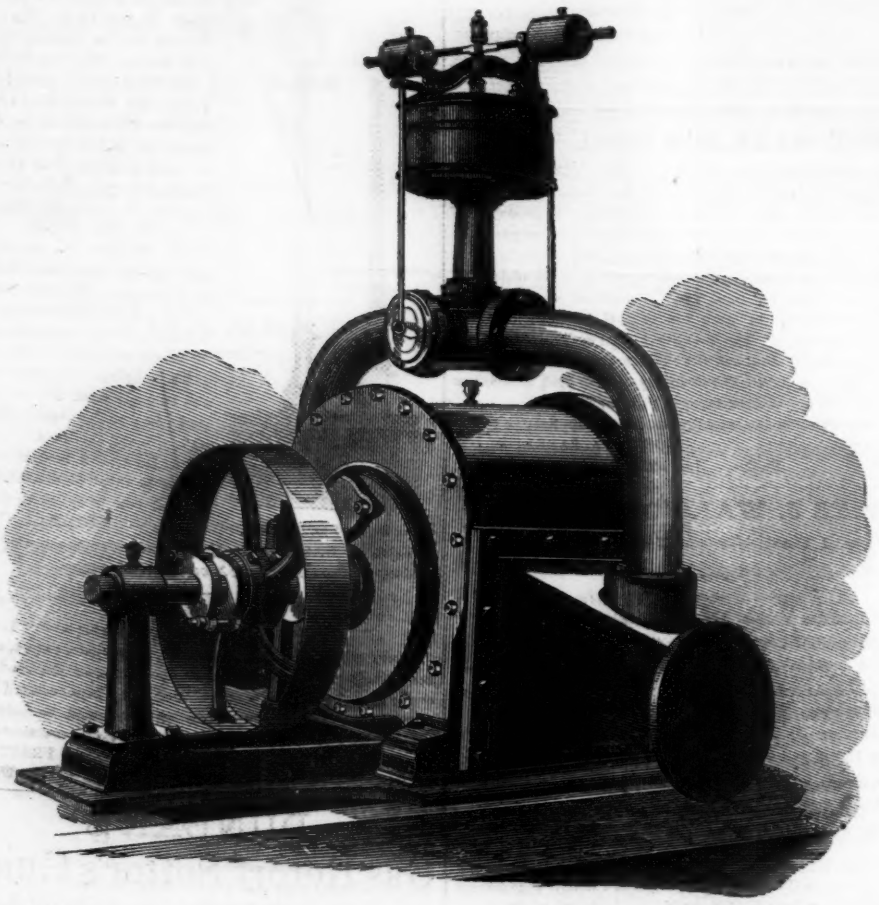

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, eitheclay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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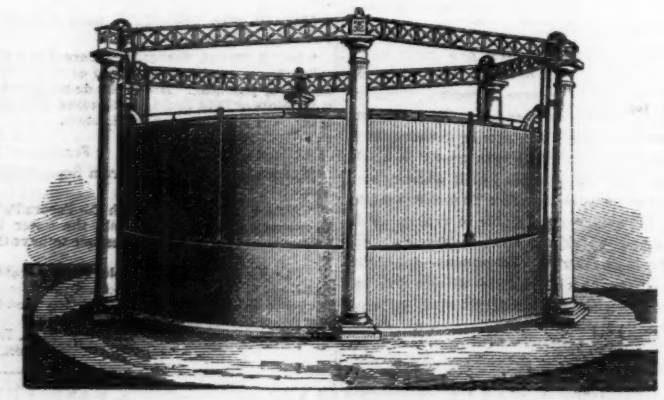

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FIG. 1.

Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate.

Fig. 3, a section through body, gate and wedge, intended for larger sizes of water valves required to bear heavy pressure either side.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

In closing the valves, when opening I is covered, slides, G G, pass the lower ends of ribs, H H, when the wedge, D, can move forward on the inclined planes E E, and crowd the gates apart.

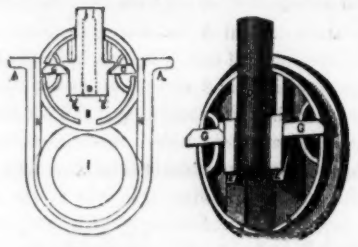

FIG. 3. FIG. 2.

[From A. F. Havens, Engineer Brooklyn Gas-Light Co.]

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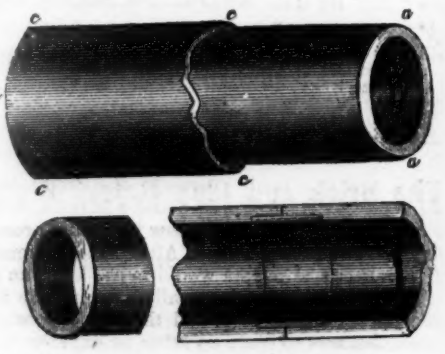

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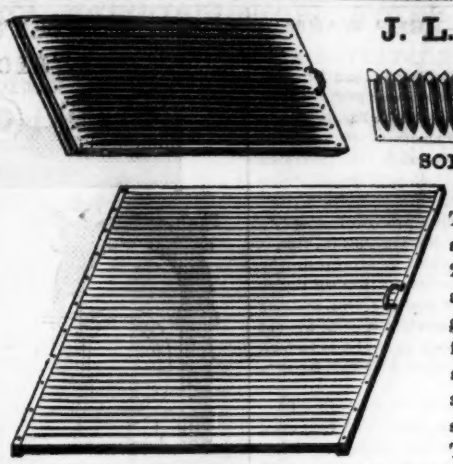

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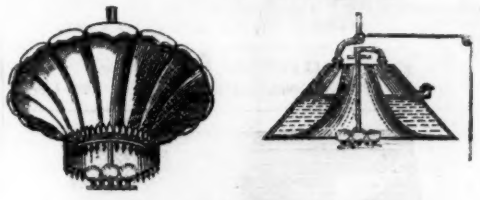

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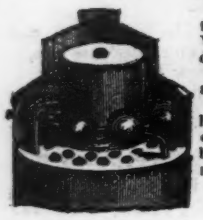

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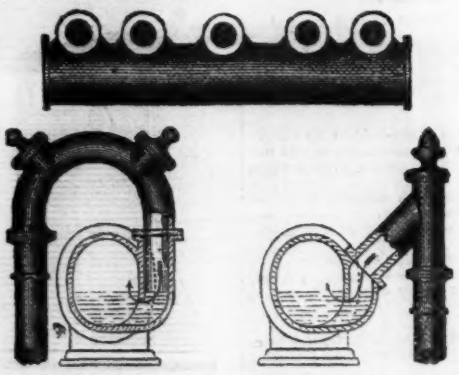

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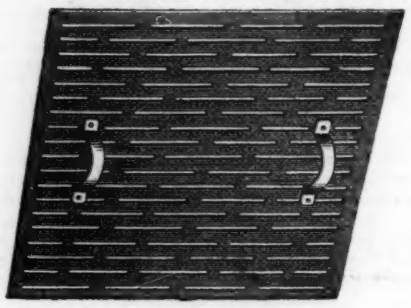

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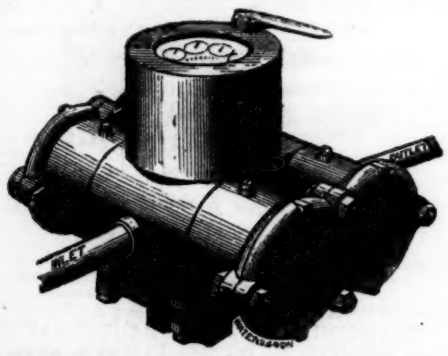

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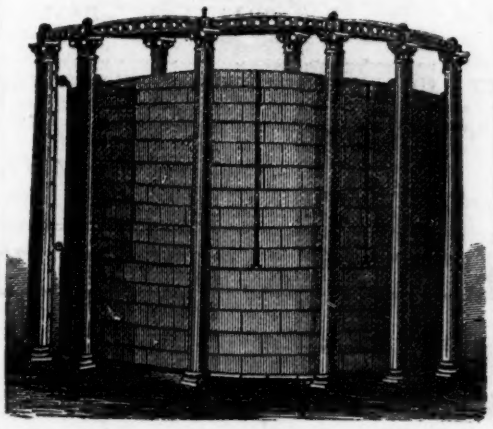

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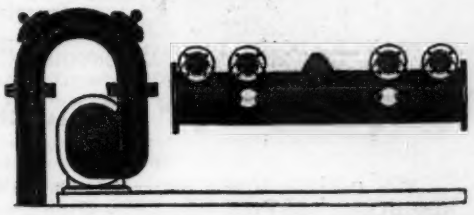

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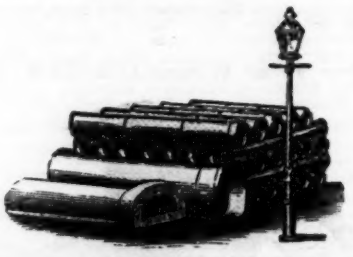

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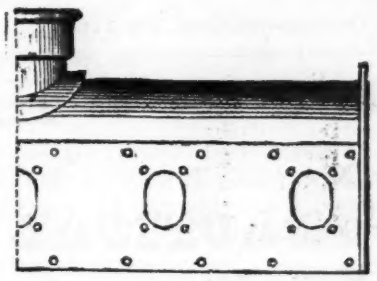

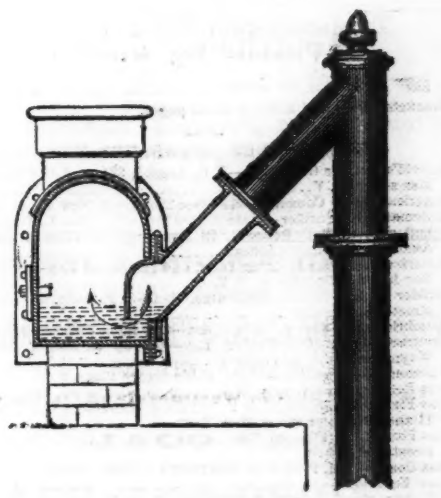

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